

# PDO

PROJECT DELIVERY QUARTERLY

SPRING 2017



Construction • Design • Engineering Services •  
Environmental • Project Management • Right  
of Way and Land Surveys

The background of the cover is a photograph of a modern architectural structure at night. The structure has a large, flat roof with a pattern of circular indentations. Several circular light fixtures are embedded in the roof, each emitting a different color of light (blue, green, yellow, red). The structure is supported by thick, white columns that also feature the circular pattern. In the background, a parking lot with a few cars and a building with a Ferris wheel are visible under a dark sky.

**Innovation  
in Project Delivery**

# Innovation in Project Delivery



I am pleased to present the Spring 2017 edition of the **PROJECT DELIVERY QUARTERLY** (PDQ). This edition, like the last edition, emphasizes the importance of “Innovation” as a central focus in our business model.

The two articles in this edition highlight innovations that support the Caltrans Mission, Vision, and Goals, and provide tremendous benefits to the state. The first article focuses on “Accelerated Bridge Construction,” a bridge construction method that uses innovative planning, design, materials, contracting, and construction techniques in a safe and cost-effective manner, to reduce the number of on-site working days and construction related impacts that occur when building, replacing or rehabilitating bridges.

The second article describes Project Management’s impressive recent invention: a new database application that dramatically improves communication, collaboration, and delivery of Project Change Requests.

Project Delivery, like every effective organization, thrives when we engage in creative thinking to strategically improve delivery processes. Even historic and successful Caltrans programs, such as the [State Scenic Highway Program](#) created by the California Legislature in 1963, recently benefited from an internal review. The Program refined the final approval steps undertaken by Caltrans headquarters and District Directors during the last stages of a scenic highway nomination. As a result, the improved process allowed for the seamless official

*Cover and back photos: [Transportation Art](#) in District 4. This project, along with several other [Transportation Art](#) installations in District 4 won a [California Transportation Foundation](#) award in the category, **Sustainable Transportation/Environmental Enhancement Program of the Year** (2015). “Sensing YOU” is an interactive artwork utilizing light and paint at I-87/Santa Clara Street, in San Jose—by artist Don Corson.*







*Photo above: The spectacular Gaviota Coast State Scenic Highway, a newly designated State Scenic Highway.  
[Photo credit: County of Santa Barbara](#)*

designation of two new State Scenic Highways: Gaviota Coast State Scenic Highway in Santa Barbara County, and Topanga Canyon State Scenic Highway in Los Angeles County.

I look forward to highlighting many more of our shared accomplishments in the coming months. My thanks go out to all in Project Delivery, whose commitment to state service enables us to meet “new challenges through leadership, innovation, and teamwork.”

A handwritten signature in black ink, appearing to read 'KB Sutliff', with a long, sweeping horizontal line extending to the right.

Karla B. Sutliff  
Project Delivery Deputy Director  
(Chief Engineer)

# Accelerated Bridge Construction (ABC): Improving Transportation with Innovative Solutions

**ABC methods can improve project delivery efficiency and reduce traffic delays while protecting environmental quality, improving worker and traveler safety, addressing aging infrastructure and responding to increased demand due to population growth.**

In the spirit of improving the transportation system with effective and innovative solutions, Caltrans is embracing Accelerated Bridge Construction (ABC). This method of bridge construction uses innovative planning, design, materials, contracting, and construction methods in a safe and cost-effective manner to reduce the number of on-site working days and construction related impacts that occur when building, replacing or rehabilitating bridges. Methods include fabricating bridge parts away from traffic and quickly assembling them onsite in a matter of weeks,

or fabricating an entire bridge offline and installing it on-site in a matter of days. Proven benefits of ABC include improved work zone safety, better environmental outcomes, and reduced impacts on the travelling public, local businesses, and the freight industry. In addition, fewer on-site working days and innovative construction methods result in direct savings in project development and construction support costs, right of way, and environmental mitigation.

## **BENEFITS**

### **Time**

By performing a significant portion of the construction away from traffic, impact times can be reduced from months to days, or from multiple seasons to a single season. Overall project duration can be reduced when ABC methods facilitate the avoidance of environmental impacts that would otherwise require permitting and more complex environmental documents.

### **Safety**

Safety is Caltrans' highest priority. The number one goal of the 2015-2020 Caltrans Strategic Management Plan calls for the improvement of safety through flexible and innovative design and delivery practices. ABC improves safety for workers and the traveling public by reducing exposure to traffic and construction activities. In addition to reducing the number of construction days at the site, ABC shortens lane restrictions, enables bridge elements to be fabricated more safely on the ground, and keeps construction activities away from traffic.





*Photo above: Fort Goff Creek Bridge*

### **Constructability**

Depending on the site, conventional construction methods can introduce constructability challenges related to traffic management, environmental constraints, and site access. Cast-in-place concrete construction is a time consuming process that requires falsework (a temporary support structure) that reduces lane widths, reduces vertical clearance, and requires multiple support locations under the structure. ABC methods eliminate the need for falsework, are less sensitive to weather conditions, are more likely to deliver in a single season, and address unique and challenging site conditions.

### **Mobility**

ABC improves mobility by reducing congestion and traffic delays typically associated with bridge construction by avoiding lengthy detours, eliminating falsework, and reducing the number of days that traffic is impacted during construction. Fewer traffic delays translate into improved livability to Californians by providing better outcomes to local businesses, the freight industry and in air quality.

## Cost

ABC can be the most cost effective means of construction. Despite bridge construction costs that are often more expensive than conventional methods, ABC methods can provide overall project savings due to fewer days on the job site and an associated reduction in management of traffic, project administration, construction management, and environmental mitigation or right of way requirements.

Caltrans is reviewing cost results from other state transportation agencies with integrated accelerated bridge programs. Vermont Department of Transportation (VTrans) data indicates 18% in average total project savings over their original project estimates for 30 projects that have incorporated various ABC strategies. For the 30 ABC projects, this represents \$13.5 million in projected “total project” savings from their originally estimated programmed dollars over a 4 year period.

ABC methods have already shown fiscal and livability benefits in California. Last year the Highgrove Underpass Railroad Truss project in southern California saved \$400,000 in construction costs and 20 months in schedule (with associated support cost savings) with the first ever large bridge move in California using self-propelled modular transporters. In 2014 two prefabricated structures (Fort Goff Creek Bridge and North Fork Mill Creek) were quickly assembled on site in northern California saving over \$500,000 in capital and support costs.

## Environmental

ABC methods provide the flexibility to schedule around crucial times, eliminate construction activities in streambeds or other sensitive areas, and conduct many activities offsite. ABC is an effective tool to address California’s fish passage program by restoring unrestricted fish passage in a single season while reducing environmental impacts related to falsework and cast-in-place concrete.

The 2014 fish passage project at Fort Goff Creek in District 2 was so well received by state and federal

environmental agencies that Caltrans was invited to work with external permitting agencies to develop a programmatic permitting process that can speed delivery by 6-12 months.

## PROGRAMMATIC APPROACH

Caltrans is committed to mainstreaming ABC as an innovative project delivery tool in support of the Fixing America’s Surface Transportation (FAST) Act, the Federal Highway Administration (FHWA) Every Day Counts (EDC) initiatives and the objectives of the 2015-2020 Caltrans Strategic Management Plan. Caltrans’ ABC efforts in the past were primarily limited to emergency projects and projects where constructability issues precluded conventional construction methods. These ABC projects have included prefabricated bridge elements and systems (PBES), Slide-in Bridge Construction, and the use of self-propelled modular transports (SPMTs) in large bridge moves. Over the last 7 years Caltrans broadened efforts to establish ABC as a competitive alternative when project delivery demands place a high value on time, traffic flow and environmental impact. The goal is to implement ABC projects not only when addressing extreme conditions but to expand the consideration of ABC to identify whether it can provide more effective and efficient results for project delivery in a greater range of settings. Successful incorporation of ABC into project delivery requires (1) a policy of ABC consideration throughout the project delivery process, (2) effective cost benefit evaluation of ABC solutions to deliver optimal project value, (3) the development of procedures, guidance and standards through implementation and (4) buy-in by Caltrans staff and external partners and stakeholders.

## Early Consideration

Division of Engineering Services (DES) guidance to the Bridge Project Engineer requires consideration of ABC methods, along with conventional construction methods, when developing advanced planning studies to reduce construction impact times, address







*Photo above: ABC has been identified as an effective tool to address California's fish passage program by restoring unrestricted fish passage in a single season —while reducing environmental impacts related to falsework and cast-in-place concrete.*

environmental constraints, or to manage a significant project risk. Going forward, DES is collaborating with the Districts to initiate ABC consideration early in the project delivery process when adjustments to funding, right of way requirements, and environmental documents are still possible to take advantage of the ABC benefits.

### Evaluation

Efficient use of ABC requires effective evaluation of the benefits that ABC brings to the project. [Current ABC decision making guidance](#) indicates when it is appropriate to pursue an ABC planning study alternative, but does not yet provide a comprehensive cost/benefit analysis that can demonstrate the full value of ABC versus conventional construction methods. DES will be teaming with other divisions within Project Delivery, and the Districts to create an evaluation tool that more thoroughly communicates the full value of ABC to stakeholders. The evaluation tool will identify the specific challenges of a project (such as access, duration of lane closure, traffic delays, impact on local business, wetland mitigation, noise constraints, safety, and weather conditions), select the ABC methods that best address those challenges, and then compare the total project cost estimate (capital and support, road and bridge) of ABC versus conventional construction. The development and use of the evaluation tool will require collaboration between internal and external stakeholders to drive project decision

making that balances construction related impacts, cost, scope, quality, and risk. The total project cost estimate will provide decision makers with an “apples to apples” comparison of bridge alternatives to select the construction method that will achieve desired project outcomes.

## Implementation

Caltrans has built several single span ABC projects in recent years, including the SHRP2 funded Fort Goff Creek Bridge (2014), and the emergency replacement of Tex Wash on Interstate 10 (September 2015). This single span construction is catching on, and several prefabricated and slide-in structures are in planning and design phases. The single span precast structure type appears to be well-suited to stream bed restoration projects and is under consideration for addressing some of the 500-plus identified fish passage barrier needs in California. To improve efficiency, DES is developing a pre-designed precast single span structure specifically for fish passage projects. This approach will expedite the lengthy permitting process typically associated with stream crossings.

ABC multi-span projects are in the pilot phase. California’s bridges carry the highest traffic volume in one of the most seismically active regions in the country. The state has spent over 3 million dollars in ABC related research to ensure ABC construction techniques do not adversely affect the seismic performance standards Caltrans has set for bridges. Research results, such as effective connection detailing, are being implemented in the recently launched multi-span ABC pilot project program. The pilot projects allow for the evaluation of current practices, testing feasibility of new methods, improving future designs, developing specifications, vetting construction challenges, and validating costs and benefits. Two pilot projects are under design and scheduled for construction in 2017 in Districts 4 and 6. Districts are asked to assist in the identification of additional multi-span ABC pilot projects to support the implementation process. The multi-span ABC Pilot Program will lead

to the standardization of design guidance, connection detailing, and specifications. Products developed along with lessons learned from the pilot projects will be incorporated into standard planning, design, and construction guidance to promote the effective and efficient use of ABC methods when determined appropriate for the site.

## Outreach

The success of ABC implementation rests largely on widespread acceptance of proven techniques by project development staff (both internal and external), funding partners, the contracting community, and the public. Caltrans efforts to implement and mainstream ABC have day-lighted the need for management support, staff and industry buy-in, and the need to identify and communicate tangible benefits of this type of construction. DES is eager to partner with the Districts and other internal functions to educate staff on the what, when and how of ABC. DES is collaborating with industry, FHWA, and local agencies to develop statewide awareness of the innovative benefits of ABC.

## FUTURE

Caltrans recognizes that ABC has an important role in addressing the current and future needs of California’s transportation system. By incorporating ABC into its project development tool box, Caltrans can effectively address transportation challenges while reducing traffic delays. Full implementation of ABC into the project delivery process requires collaboration throughout the department. DES looks forward to working collaboratively with internal and external partners to raise awareness of the technology, identify additional pilot projects, develop an effective tool that identifies ABC project opportunities, and to mainstream ABC policy into the project delivery process.

For more information, contact [Dorie Mellon, P.E.](#), Caltrans Division of Engineering Services, or visit: <http://des.onramp.dot.ca.gov/structure-policy-innovation/accelerated-bridge-construction>.



**Project Management  
recently launched  
a Project Change  
Request (PCR)  
Database Application-  
a quantum leap in how  
PCRs are prepared,  
processed, and  
archived.**

## **Project Management's Invention**

Caltrans' project delivery performance is judged on whether quality projects are delivered on schedule and within budget. Caltrans excels at meeting these performance objectives in a cost-effective manner due to rigorous project development protocols and innovative processes. A key protocol in project management is to create a "Project Change Request" (PCR) when there is an alteration to a project's scope, budget or schedule.

More than a mere administrative requirement, the PCR is a powerful consensus building tool that records a district's proposed change(s) to a project's scope, cost, and/or schedule. Since changes to projects frequently impact more than one Project Delivery division, the PCR provides a foundation for multidisciplinary input and decision-making among diverse functional units and programs.

Upon completion of the PCR, the district submits it to the PCR Committee Meeting for consideration of approval. The PCR Committee consists of representatives from the Project Delivery divisions as well as the Divisions of Maintenance and Operation, Budgets, Transportation Planning, and Transportation Programming. The committee meets monthly to discuss and evaluate all district submitted PCRs.

Project Management recently launched a PCR Database Application (PCR Application) which represents a quantum leap from how PCRs used to be prepared, processed, and archived. The new PCR Application is an Oracle web-based system— fully designed, constructed, and tested in-house to meet Caltrans Project Management needs.

Historically, PCRs were created as word documents, and then converted to PDFs. Large numbers of PCRs had to be attached to emails and sent to

multiple stakeholders during collaboration, review, approval, and archival phases. The old method posed several challenges to efficient PCR creation and processing. One shortcoming was the difficulty in identifying and promptly communicating with all of the appropriate key staff. Other limitations included the amount of work that had to be done manually, such as creating PCR inventories, and the separate instructional documents needed to train staff about PCRs.

The new PCR Application is a powerful tool that enhances communication, collaboration and dramatically increases the efficiency of PCR development and processing. The application consists of four major environments that interconnect and yet operate independently. The four environments are:

- **Home Environment-** Policy items, training videos, meeting and due dates, and user information are housed here.
- **Project Change Request Environment** -The Districts draft, develop and maintain their PCRs in this area. An unlimited number of users can provide their comments on a PCR simultaneously. The PCR App includes an email system that connects the database to the Caltrans email system. Once a PCR is routed, the email logic tool automatically notifies recipients of a PCR via email.
- **Headquarters (HQs) Current Agenda-** This environment contains the PCRs to be discussed at the next committee meeting.
- **Archives-** All processed and approved PCRs are stored here.

The PCR Application Version 1.01 is equipped with a routing tool to route a PCR internally from the initiation through final completion. The PCR Application also initiates regular quality checks. Once the PCR is completed, the PCR moves from the district environment to the HQs PCR agenda environment, and then ultimately to the statewide PCR archives. The application is designed to archive an unlimited number of PCRs.

The design and construction of the PCR Application Version 1.00 began in mid-December 2014 and finished in late January 2015. The table below highlights additional milestones, and the completion dates, from Version 1.0 to the statewide roll-out of Version 1.01.

Creation of the PCR Application exemplifies an extremely streamlined business process. The creators

### Timeline of PCR Database Application Development Phases by Completion Date

Jan 2015	PCR Database Application Version 1.0
March & May 2015	Remote Tests
July 2015	IT's Initial Needs, from PC to Server
Feb-Nov 2015	System Tests
Sept 2015	Piloted in Districts 5 & 12
Nov 2015	IT and Email Server
Dec 2015	Version 1.01
Jan-May 2016	Statewide Launch & Outreach

included only one subject matter expert and one programmer, with additional staff involved in robust testing, communication, and administrative aspects of the project. The expertise of the team allowed an expedited timeline (version 1.0 was completed in 45 days) and an extremely modest budget for the application's development. The PCR Application, which now boast 685 users statewide, is entirely original and is not an "off-the-shelf" product. The development of the PCR Application serves as an effective and lean business model for future technology development efforts.

As the number of PCRs continues to grow (from just over two hundred in the 2010-2011 fiscal year, to over five hundred in 2015-2016) this powerful tool has already proven to be a breakthrough innovation to modernize Caltrans project management processes.

For more information about the PCR Database Application contact [Reza Afhami, PE.](#) For more information about the PCR Program, contact [Horacio Paras, Jr., PE.](#)





### **Collaboration**

Each user in the database can view, provide comments and reach consensus as a PCR is being developed.

### **Efficient PCR Development & Processing**

Users can efficiently create, develop, and reach consensus regarding a PCR, entirely within the PCR Database Application.

### **Transparency**

Each PCR can be easily searched and viewed from initiation through to completion within the database application.

### **Enhanced Communication**

PDT members can easily access and communicate with others within the database application.

## **Key Benefits of PCR Database & Tools**

### **Stable Archives**

Each processed PCR is archived and retrievable from within an independent environment.

### **Real-Time Meeting Agendas & Archive Links**

A Reports Application tool generates meeting agendas automatically. Agendas and archived PCRs are available on the HQ Division of Project Management webpage.

### **Paper Conservation**

The database enables paperless development and distribution of PCRs. PCRs can be saved as PDFs and can be distributed electronically.

### **Efficient Data Analyses & Reporting**

Multiple types of reports can be generated and distributed via the database application.

## **Key Features of the PCR Database & Associated Tools**

### **Email Logic for the Routing Tool**

The database application includes an email system that connects the database to the Caltrans email system. Once a PCR is routed, the email logic tool automatically notifies the recipient of a PCR via email.

### **Independent Email Notification System**

During the collaboration phase, each user can communicate with other users via an independent email system designed and constructed within the PCR Database Application.

### **Comment Section with Floating Window Interface**

Unlimited number of users can provide their comments on a PCR simultaneously.

### **Instructions Within PCR**

The database includes detailed instructions within each field to assist in PCR preparation.

### **Application for Reports**

The database includes an application that generates materialized views of all the data and provides tools that can be used to meet various reporting needs.

### **Flexible User Rights**

User rights are role-dependent. Based on each staff role, a number of default user rights have been assigned. The database is flexible; in lieu of the default rights, a variety of user rights can be customized for each user, if needed.

### **Infrastructure for other Data Imports, Text Message, and Electronic Signature**

The application, version 1.01 contains the required infrastructure for various future developments.

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Photo: The interactive art installation "Sensing YOU" installed with the assistance of the Caltrans Transportation Art program, detects bicyclists and pedestrian movement to activate illuminated rings. The rings light up in pre-programmed sequences on the ceiling surface of the I-87 highway underpass in San Jose. Users can also interact with the installation via a smartphone multi-player game.